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A framework for evaluating flood risk governance

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A framework for evaluating flood risk governance

Abstract

Calls to strengthen flood risk governance are echoed across Europe amidst a growing consensus that floods will increase in the future. Accompanying the pursuit of societal resilience, other normative agendas relating legitimacy (e.g. accountability and public participation), and resource efficiency, have become attached to discussions concerning flood risk governance. Whilst these represent goals against which ‘success’ is socially and politically judged, lacking from the literature is a coherent framework to operationalise these concepts and evaluate the degree to which these are achieved. Drawing from cross-disciplinary and cross-country research conducted within the EU project STAR-FLOOD, this paper presents a framework for evaluating the extent to which flood risk governance arrangements support societal resilience, and demonstrate efficiency and legitimacy. Through empirical research in England, this paper critically reflects on the value of this approach in terms of identifying entry points to strengthen governance in the pursuit of these goals.

Key words

Governance; evaluation; flood risk management; resilience; efficiency; legitimacy;

1. Introduction

Amidst a growing consensus that floods will increase in the future (Feyen et al., 2012), flood risk governance, through which Flood Risk Management (FRM) is delivered, has emerged as a focal point of policy and research attention. In the pursuit of societal resilience, critical questions arise about how current governance arrangements support or alternatively constrain this goal. Different schools of thought have posited that resilience can be measured in terms of the capacity to resist, absorb, recover and/or adapt to stresses and so-called ‘shock’ events (e.g. Folke, 2006; Djalante et al., 2011). These different standpoints naturally have implications for how resilience is measured and for identifying necessary characteristics of flood risk governance.

Accompanying the pursuit of societal resilience, efficiency discourses have arguably grown in momentum following the global financial crisis in 2008 and an increased need to demonstrate the best value for public monies (OECD, 2015). However, the redundancy and diversity of FRM measures requested for resilience (Hegger et al., 2014), are at odds with this endeavour. In addition to resource efficiency, other recurring standards of flood risk governance (and ‘good’ governance more broadly), include transparency, inclusive and participatory decision-making, accountability, procedural justice, social equity and societal acceptance (Termeer et al., 2011; OECD, 2015; Thaler and Hartmann, 2016). These criteria can be assimilated into the umbrella notion of legitimacy.

Drawing from public administration and legal research performed within the EU project “STAR-FLOOD”, this paper critically reviews the concepts of societal resilience, efficiency and legitimacy, and seeming conflicts between these. Addressing a neglected gap in the literature, this paper presents a framework for evaluating flood risk governance in terms of these desired goals. Using English flood risk governance as an empirical example, this paper highlights the value of this approach as a tool for identifying entry points to strengthen governance in the pursuit of these goals.

2. Conceptualising flood risk governance

Although governance is a disputed concept, there is a consensus that it captures the dynamics of governing in the pursuit of a collective goal (Lange et al., 2013). Theoretical debates are formed around the different modes of governance, connected to the configuration of actors (public authorities, private and civil society), distribution of power and institutional structures (Driessen et al., 2012). For some, governance marks a transition from traditional State-led, 'top-down' decision-making, towards increasingly complex actor networks and non-hierarchical processes (Pahl-Wostl et al., 2013; Walker et al., 2014); signifying a shift from 'government to governance' (Swyngedouw, 2005). However, the impression that governance has emerged in a unidirectional fashion is opposed by the argument that hybrid forms of governance seem to exist (Shiroyama et al., 2012). Indeed, Bell and Hindmoor (2009) argue that whilst the state may have diversified governance strategies, they continue to be a pivotal actor. Thus it is possible to discern centralised modes of governance, typifying traditional forms of government-led decision-making, alongside other forms of governance (e.g. decentralised, public-private, interactive and self-governance; see Driessen et al., 2012).

A key point of contention within governance literature concerns the scales and levels through which governance processes occur, and corresponding impact upon the type and scale of solutions to environmental problems. For instance, monocentric forms of governance are concerned with structural reforms and clarifying responsibilities at different administrative levels (Termeer et al., 2010). However, there is mounting evidence to suggest that this approach is insufficient to anticipate and respond to uncertainty and complexity of contemporary environmental challenges (Renn et al., 2011). This has led to the emergence of multi-level governance (Newig and Fritsch, 2008), polycentricity (Ostrom, 1961) and adaptive governance (Rijke et al., 2012; Chaffin et al., 2014). Connecting these different theoretical positions is the recognition of scale conflicts between administrative levels and the scale of environmental problems (OECD, 2015). Building upon these theoretical standpoints, this paper acknowledges the importance of multi-level governance and the necessity of coordination mechanisms to deliver effective governance. However, features of adaptive governance, such as the capacity to transform, are also seen as desirable.

The term flood risk governance denotes a specific form of risk governance, defined by Renn et al. (2011; p8) as 'the translation of the substance and core principles of governance to the context of risk and risk-related decision-making'. Whilst risk management is delivered through risk governance, the concept extends beyond this and requires consideration of 'the complex web of actors, rules, conventions, processes and mechanisms concerned with how relevant risk information is collected, analysed and communicated, and decisions are taken' (Renn et al., 2001; p8). Adopting this line of argumentation, 'flood' is attached to this concept to make explicit the type of risk under study and to delineate this from other forms of contemporary risks. A Flood Risk Governance Arrangement (FRGA) can therefore be defined as the actor networks, rules, resources, discourses and multi-level coordination mechanisms through which FRM is pursued (Alexander et al., 2016). Within this overarching arrangement, sub-governance arrangements (sub-FRGAs) are discernible according to distinct goals within FRM (e.g. spatial planning aims to minimise exposure, whereas defence reduces the likelihood of hazard occurrence).

3. A framework for evaluating flood risk governance

Evaluation can be approached as a series of ‘building blocks’ through which insights obtained from smaller units of analysis inform an understanding of increasingly more complex objects (i.e. the overarching FRGA). Thus the proposed framework is designed to be flexible and can be tailored accordingly.

Arguably, the biggest challenge is the selection of appropriate evaluation criteria. Although, a number of recurring themes are evident within the literature, relating to legitimacy, transparency, accountability, fairness, effectiveness, efficiency and sustainability (e.g. Rogers and Hall, 2002; Lockwood et al., 2010; OECD, 2010; Termeer et al., 2011.); noticeably absent is a coherent framework for evaluating risk governance. Ultimately, the selection of criteria needs to be informed by the subject matter; therefore the first objective of this research was to consult flood risk management policy in the selected countries (Priest et al., 2013). Although flood risk governance has evolved and functions within different cultural, socio-economic, political and cultural settings, a set of shared normative goals exist between selected countries (i.e. Netherlands, England, France, Poland, Belgium and Sweden). These relate to efforts to enhance societal resilience to flooding, improve efficiency and strengthen the legitimacy of flood risk governance; therefore, these form the foundation of the proposed framework. It was decided to exclude ‘effectiveness’ as a criterion in its own right (e.g. Rogers and Hall, 2002), as this can actually be conceived as a precondition for each evaluation criterion and therefore inherently embedded within the evaluation process. For example, a flood defence cannot enhance the capacity to resist flooding, unless it is able to effectively withstand its design storm. In this sense, the condition of effectiveness can be operationalised according to Young’s (1994) definition of ‘goal attainment’.

To obtain an understanding of ‘the whole’ it is necessary to shift the locus of evaluation (Box 1) and reflect on the process, outcome and impact of governance arrangements (Rogers and Hall, 2002). Although resilience, efficiency and legitimacy may superficially appear to function on different levels, as the reader will observe, the proposed criteria and corresponding benchmarks can relate to more than one loci of evaluation; albeit some are more closely aligned to some than others (Tables 1-3).

Box 1: Defining different loci of evaluation

| Loci of evaluation | |
|--------------------|---|
| Process: | The inputs, throughput and outputs of the decision-making process. Inputs may include certain resources or stakeholder participation; whereas outputs refer to the result of the decision-making process, such as agreement on a specific course of action. ‘Throughput’ captures the internal processes and practices connecting inputs to outputs. Rather than isolating these terms (e.g. Schmidt, 2013), these are integrated within the term ‘process’ to simplify the framework and improve usability. For example, one might examine the extent to which citizens participate in the process, the nature of public participation (e.g. consultation) and extent to which citizen views influence the resulting output. |
| Outcome: | The implementation of the outputs from the decision-making process, such as the decision to erect flood defences or the production of a legal instrument outlining responsibilities for flood risk assessment and mapping practices. |
| Impact: | The resulting effect of the decision-making process and outcome. For example, the extent to which the use of flood zones in spatial planning minimises development on the floodplain. |

3.1 Flood risk governance in the pursuit of societal resilience

Given the mounting challenges posed by natural hazards, there is a pressing need to ‘govern for resilience’ (Djalante et al., 2011). However, as a result of different theoretical interpretations of resilience, there are numerous ways in which it might be assessed. In response to an ongoing stress or sudden shock, societal resilience can be conceptualised as i) a measure of resistance (i.e. ability to block a disruptive event), ii) a measure of return to normality (i.e. recovery), iii) a measure of absorption and persistence, or as iv) a measure of adaptive capacity (including capabilities to learn and effect change).

The relationship between resistance and resilience is highly contested. For example, de Bruijn (2004) argue that whereas resistance strategies act to prevent flooding, resilience strategies minimise flood impacts and facilitate recovery. However, the resistance discourse is noticeably embedded within the policy discourse of societal resilience in the selected EU countries. Acknowledging this, this research conceives the capacity to resist as one facet of resilience.

There is growing recognition that floods cannot always be prevented through engineered solutions, as defences are not infallible, economically feasible or sustainable long-term (Hegger et al., 2014). Therefore, governance should also support the capacity to absorb and recover. Diversity in the arrangement of intervention and management measures enables the problem to be managed at multiple scales and is seen as an import ‘fail safe’ (Renn et al., 2011; Hegger et al., 2014). The presence of multi-layered institutions also allows for ‘scale matching’ and to ‘improve the fit between knowledge, action, and socio-ecological processes’ (Djalante et al., 2011: p4).

Whilst this facet of resilience appears to be dominant in public policy, this is often criticised for neglecting the need to adapt and transform socio-environmental systems. Moreover, authors have criticised the lack of criticality about the alignment between resilience and neoliberalism ideology. McKinnon and Driscoll Derickson (2012) argue that the concept of resilience ‘normalizes the uneven effects of neoliberal governance’ and absolves the state of accountability (p17). Similar concerns have been raised in England, where policy discourse emphasizes self-reliance at the community scale and essentially shifts responsibility without corresponding shifts in power (Penning-Rowsell and Johnson, 2015). Acknowledging this valid critique, the framework presented here asserts the importance of performing evaluation at multiple scales, recognizing that societal resilience is shaped through multi-level factors.

A third facet of resilience relates to the capacity to adapt (Adger et al., 2005). Attached to this, social and institutional learning, alongside opportunities to innovate and experiment are seen as important features of governance (Duit et al., 2010; Djalante et al., 2011; Termeer et al., 2011). Adaptive governance is often conceptualized as the capability to self-organize, adjust and transform processes and structures in response to changing social-ecological systems (Djalante et al., 2011; Rijke et al., 2012). Systematic and iterative learning processes are fundamental for this (Pahl-Wostl et al., 2013), as well as flexible rule structures (e.g. soft law) to accommodate uncertainty (Termeer et al., 2011). Synthesising this discussion, Table 1 identifies benchmarks of successful governance if it is to support societal resilience to flooding.

Table 1: Benchmarks for determining the extent to which flood risk governance supports societal resilience

| Evaluation criteria | Benchmarks of success | Dominant locus of evaluation |
|--------------------------------|--|------------------------------|
| Capacity to resist | <ul style="list-style-type: none"> The assembly of measures/projects/or governance arrangements is shown to have enhanced the capacity of the social-environmental system to reduce the likelihood and/or magnitude of flood hazard | Outcome Impact |
| Capacity to absorb and recover | <ul style="list-style-type: none"> Diversity of measures/projects/or FRM strategies to address risk in a holistic way (i.e. from the likelihood of occurrence (resistance) to the potential range of consequences) | Outcome |
| | <ul style="list-style-type: none"> Bridging mechanisms exist which support integration and coordination between different levels of governance and sub-governance arrangements | Process |
| | <ul style="list-style-type: none"> Use of measures/projects/FRM strategies is multi-layered to address risk at different spatial and temporal scales | Outcome |
| | <ul style="list-style-type: none"> The assembly of measures/projects/or governance arrangements is shown to have enhanced the resilience of the social-environmental system in terms of reducing the consequences, enabling the system to absorb and/or quickly recover | Outcome Impact |
| Capacity to adapt* | <ul style="list-style-type: none"> Opportunities for learning and evidence that 'lessons learned' are implemented | Process Outcome |
| | <ul style="list-style-type: none"> Opportunities are created for innovation and experimentation | Process Outcome |
| | <ul style="list-style-type: none"> The legal framework or legal instruments / plans and programmes are subject to periodic review proceedings in order to incorporate new information about climate change and floods | Process Outcome |
| | <ul style="list-style-type: none"> There is a balance between adequate flexibility in the legal framework in order to allow adjustments and legal certainty | Process |
| | <ul style="list-style-type: none"> Evidence that future risks and uncertainty (e.g. climate change) are factored into the decision-making process | Process Outcome Impact |

* There are clear difficulties in demonstrating 'impact' when evaluating the capacity to adapt, which, given its underlying principles of learning and improvement, manifest in improved capacities to resist, absorb and recover in the (unbounded) future.

3.2 Flood risk governance in the pursuit of resource efficiency

Efficiency is a recurring criterion in evaluations of environmental governance (OECD, 2015). Efficient flood risk governance is politically and socially desirable, especially as FRM is largely funded by public money. This is seen as necessary for delivering sustainable FRM, as emphasised in national and European policy (e.g. Defra/EA, 2011). The concept of efficiency can be applied to a range of resources, including economic, human (e.g. knowledge, skills and personnel) and technological (e.g. flood risk modelling and mapping).

Concerns for efficiency are often evidence by established methods for determining resource allocation, such as Cost-Benefit Analysis where the feasibility of defence measures are weighed against alternatives (Hanley and Black, 2006). Other benchmarks may include attempts to diversify funding sources and burden-sharing arrangements, such as public-private partnerships. However, efforts to secure the efficient use of financial resources should be assessed over short to long-term timescales, if the availability and sustainability of finances is to be guaranteed (OECD, 2015). Measures for other types of resources may include Mutual Aid Agreements (for sharing personnel) and statutory duties for flood risk professionals to cooperate and share information. As discussed by Termeer et al. (2010) transaction costs can escalate within multi-level governance arrangements, thus strategies for minimising these are required.

Efficiency may appear to conflict with the notion of ‘back-ups’ and redundancy advocated for resilience. This is in fact a complex relationship, dependent on how costs are dispersed across different potential funding sources (e.g. public, private sector). Furthermore, the most efficient use of resources may leave no reserve to deploy when shock events occur, or may even dissuade long-term adaptations. However, it is clear from policy analysis performed as part of this research, that resilience and efficiency are not of equal importance in FRM policy (i.e. resilience-goals are regarded as superior to efficiency-goals).

Table 2: Benchmarks for determining the extent to which flood risk governance can be described as efficient

| Evaluation criteria | Benchmarks for efficient flood risk governance | Dominant locus of evaluation |
|--|--|------------------------------|
| Resource efficiency (Including economic, human (personnel, skills and knowledge) and technological resources) | <ul style="list-style-type: none"> ▪ The flood risk governance arrangement or sub-entities of governance (e.g. FRM measures, projects or sub-arrangements) use resources in an efficient manner, based on the ratio of desired output(s) to input(s) | Process Outcome |
| | <ul style="list-style-type: none"> ▪ Concerns for resource efficiency are widely evident within the flood risk governance arrangement (and delivered activities), as well as within the legal framework and/or are taken into account in amendments and reforms | Process |
| | <ul style="list-style-type: none"> ▪ FRM measures deliver multiple benefits, for example economic, social and / or environmental benefits or address multiple problems (thus reducing the need for multiple schemes/projects at added cost) | Process Outcome Impact |
| | <ul style="list-style-type: none"> ▪ The legal and institutional framework favour good cooperation between the different actors involved in FRM (ensuring timely exchange of information and minimising the overlap of tasks completed by different actors) | Process |
| | <ul style="list-style-type: none"> ▪ Resource efficiency is allied to goals of sustainable FRM (thus demonstrating concerns with long-term efficiency) (e.g. evidence of short- to long-term financial planning) | Process |
| | <ul style="list-style-type: none"> ▪ The legal framework, the overall process of decision-making and delivered-activities are described as efficient by relevant actors and stakeholders | Outcome |

3.3 Flood risk governance in the pursuit of legitimacy

Legitimacy is widely cited as essential for ‘good governance’ (UNDP, 1997; OECD, 2015). Allied concepts of transparency, accountability, procedural justice, fairness and social equity, inclusiveness, public participation and acceptance are either distinguished from (e.g. Lockwood et al., 2010) or enveloped within the concept of legitimacy (e.g. Termeer et al., 2011). In part, this conceptual confusion reflects different disciplinary perspectives, through political theory, philosophy, law and public administration. Complicating matters further, the shift in emphasis between input, throughput and output legitimacy manifest in different evaluation criteria (Lindgren and Persson, 2010; Schmidt, 2013). For instance, input legitimacy may be measured in terms of participatory quality, whereas output legitimacy refers to the judgement of the resulting outcomes (e.g. added value; Scharpf, 1999). Connecting these, throughput legitimacy focuses on the efficacy, accountability, transparency, inclusiveness and openness of governance processes (Schmidt, 2013). In the absence of an agreed set of legitimacy criteria, this research focuses on the recurrent and most pertinent criteria (Table 3).

Accountability is a prominent feature of governance discourse. However, the emergence of multi-level governance and diversified actors networks necessitates a broader approach to accountability assessments, beyond the traditional focus on democratic legitimacy, to include

other indicators whereby non-state actors are held accountable (e.g. public inquiries, media ‘trials’). Evaluations of accountability should examine the means and process through which involved actors are held responsible for their output decisions (Schmidt, 2013). A prerequisite for accountability is the transparency of the process and outcome (Ahrens and Rudolph, 2006). Related to this, citizens must have access to information. These conditions are reinforced through EU and domestic policies and law (e.g. Aarhus Convention 1998, EU 2001).

Ultimately, governance arrangements should enable citizens to articulate their interests and exercise their legal rights (UNDP, 1997). This can be framed in terms of procedural justice and understood as the fairness of decision-making processes, as well as the ability to challenge decisions that have been made (Johnson et al., 2007). According to Hendriks (2014), procedural justice is a core value of good governance, related to several process values such as lawfulness, transparency, accountability and equality of rights. Similarly, Bowers and Robinson (2012) emphasise the importance of neutrality, accuracy, consistency, transparency, trustworthiness and fairness as key criteria for procedural legitimacy.

Fairness, equity and distributive justice are often aligned to legitimacy debates (Shiroyama et al., 2012; Gross-Camp et al., 2012; OECD, 2015). Here, distributive justice refers to the extent to which the outcomes of decision-making processes can be considered to be fair (rather than necessarily equal). Flood risk management is presented with a range of justice dilemmas, such as the allocation of resources and whether or how to differentiate standards of flood protection. Addressing these dilemmas, Thaler and Hartmann (2016) identify how different concepts of justice (utilitarian, libertarian and egalitarian) manifest in different FRM approaches. Thus what is deemed to be socially equitable will vary accordingly. Recognising the importance of culturally-sensitive and context-based evaluation, the evaluation framework does not impose a normative position on this matter; although researchers are encouraged to critically reflect on this. Nonetheless, we acknowledge that the decision to embed social equity within the umbrella of legitimacy is in itself a normative stance and one similarly adopted by others (e.g. Termeer et al., 2011).

Another prevalent criterion is public participation, which is often seen as a means of addressing distrust and lack of confidence in formal institutions (EC, 2001), as well as democratising governance (Bulkeley and Mol, 2003). Assessments of participation should consider the quality of the process, when and how it is undertaken, and the access and representation of certain groups. Increased participation is widely regarded as better for multiple reasons (i.e. increased democracy, improved quality of outputs, procedural fairness and facilitating acceptance of decision-making; Hartmann and Spit, 2016). However, there is a need to acknowledge that there may be justifications to limit stakeholder involvement (e.g. situations requiring certified expertise) or instances where representative authorities and accountable institutions (legitimised via the political system), can determine appropriate actions (Hartmann and Spit, 2016). Moreover, the quality of participation should be considered. Indeed, participation is not a guarantee of fairness, but could reinforce the interests of already powerful groups. Nonetheless, participation is often framed as a crucial pathway for achieving output legitimacy, whereby the outputs of decision-making are deemed by society as acceptable (Newig and Fritsch, 2008; Lockwood et al., 2010; Schmidt, 2013).

A final point to note, is that there are important differences between ‘output legitimacy’ and how output is defined with process-based evaluations of governance (Box 1). Whereas the

latter is simply concerned with the result of input and throughput (e.g. a specific decision about flood safety standards), output legitimacy is akin to our conceptualisation of outcome-based evaluation and focuses on the implementation of this result (e.g. is it perceived to be fair?). Indeed, if a decision is reached, yet never implemented, then the need for evaluation is arguably redundant. For this reason, the framework presented in this paper uses the term ‘outcome’ in an attempt to clarify this conceptual confusion, as well as introducing an extension to evaluation whereby the impact of outcomes are critically analysed.

Table 3: Benchmarks for determining the extent to which flood risk governance can be described as legitimate

| Evaluation criteria | Benchmarks for legitimate flood risk governance | Dominant locus of evaluation |
|----------------------------|--|-------------------------------------|
| Social equity | ▪ The distribution of costs and benefits are fully considered within the decision-making process and communicated to those affected | Process |
| | ▪ The process and outcome of the decision-making is perceived to be fair | Outcome Impact |
| Accountability | ▪ There are opportunities for stakeholders to challenge decisions that have been made and hold the diversity of actors involved to account | Process Outcome |
| Transparency | ▪ The decision-making process is transparent so all can see how decisions were made (e.g. public inquiries) | Process Outcome |
| Participation | ▪ Stakeholder participation has been sought through various stages in the decision-making process, based on a model of knowledge exchange | Process |
| | ▪ A range of stakeholders have been involved in stakeholder participation (inclusiveness) | Process |
| | ▪ The views of stakeholders have been considered and integrated within decision-making | Outcome Impact |
| Access to information | ▪ Stakeholders have equal access to relevant information about the problem and how it will be managed | Process |
| Procedural justice | ▪ There are opportunities for stakeholders to challenge decisions that have been made | Process |
| | ▪ Stakeholder have equal access to the appeal process | Process |
| | ▪ The process of resolving disputes is considered to be fair | Outcome |
| Acceptability | ▪ The processes involved in decision-making are accepted by stakeholders | Outcome |
| | ▪ Decisions are accepted by stakeholders | Outcome Impact |

4. Methods for application

To validate this evaluation framework, empirical research was conducted in England. A range of data were consulted, including national policy (e.g. Defra/EA, 2011; Defra, 2012a), legislation, spending figures (e.g. Defra, 2014a), as well as independent and public inquiries (e.g. Pitt, 2008; Efra committee, 2015). This was accompanied by over sixty semi-structured interviews with past and current flood risk professionals to capture a range of perspectives, from policy to practice, situated at national to local scales. Three case studies were selected for further in-depth study to facilitate understanding of how national governance arrangements influence local FRM (Table 4). Interviewees were asked to reflect on their specific area of expertise and consider the current strengths, weaknesses and constraining factors limiting the success of FRM in terms of societal resilience, efficiency and legitimacy. These interviews were then subject to thematic analysis and systematic coding (Fereday and Muir-Cochrane, 2008). These results were then theoretically combined with the findings from desk-based analysis to construct a holistic evaluation of flood risk governance in England.

Table 4: Case studies for evaluating flood risk governance at the local scale

| Case study | Rationale |
|---|---|
| Kingston-upon-Hull, Yorkshire, NE England | Several Flood Alleviation Schemes (based on flood storage) are at various stages of design, consultation and construction; the most of advanced of which is the Willerby and Derringham Flood Alleviation Scheme (WADFAS) and partly funded by the European Regional Development Fund. |
| River Thames Scheme, Lower Thames, SE England | The River Thames Scheme (RTS) is an example where a range of FRM measures are being considered at different spatial scales, including alleviation channels, dredging, increased flow capacity via weir amendments as well as property-level measures. An additional £50m must still be sourced at the local scale. |
| City of Leeds, Yorkshire, NE England | The Leeds city centre River Aire Flood Alleviation Scheme (RAFAS) represents an innovative project and will be the first time moveable weirs will have been installed in England to reduce flood risk. The scheme has received funding from Defra's Growth Fund as well as the Regional Growth Fund administered by the Department for Business, Innovation and Skills. |

Drawing from the comprehensive evaluation of English flood risk governance presented in Alexander et al. (2016), Table 5 presents some selected examples. The distinction is made between the features that were found (to varying degrees) to support or constrain resilience, efficiency and legitimacy. Therefore, the table should not be viewed in binary terms nor interpreted as equally-weighted (Alexander et al., 2016). Due to practical constraints, the following discussion focuses on a sub-set of these results in relation to a sub-FRGA for fluvial and coastal flood defence and mitigation. This includes a range of measures which are employed to minimise the likelihood and magnitude of flooding, by resisting (e.g. embankments) or accommodating (e.g. flood storage areas) water, respectively (Hegger et al., 2014).

Table 5: Evaluating flood risk governance: Selected examples from England (based on Alexander et al., 2016)

| | Evaluation criteria | Supportive features of flood risk governance | Constraining features of flood risk governance |
|-------------------|--------------------------------|--|---|
| RESILIENCE | Capacity to resist flooding | <ul style="list-style-type: none"> - 6 year capital commitment of £2.3bn outlined in the National Investment Plan (Defra, 2014a); - Introduction of Partnership Funding means all defence schemes are now eligible for some funding; | <ul style="list-style-type: none"> - Challenge of securing funding outside of public sector means some defence schemes are unable to begin construction; - Revenue (maintenance) is allocated annually and lacks the security of the 6 year investment programme new projects; although this budget was recently projected until 2021 (HM Treasury, 2015); |
| | Capacity to absorb and recover | <ul style="list-style-type: none"> - Highly effective institutional arrangements for emergency management; - High penetration of insurance to facilitate financial recovery from floods. | <ul style="list-style-type: none"> - Efforts to encourage citizen involvement in FRM can be slow to take effect (due to risk perception, sustaining interest post-flood, access to resources); - Forecasting capabilities for surface water warning are less developed. |
| | Capacity to adapt | <ul style="list-style-type: none"> - The transition towards risk-reflective pricing in insurance under the Flood Re scheme could incentivise adaptive reinstatement; - Catchment Flood Management Plans support strategic decision-making over a 50 to 100 year timescale; | <ul style="list-style-type: none"> - Lack of incentives to incorporate adaptation within spatial planning for new and existing developments in areas at risk of flooding; - Capped flood insurance within Flood Re could override the financial incentive for homeowners to reduce their own risk and it remains unclear how property-level resilience measures (once installed) will be rewarded by insurers; |
| EFFICIENCY | Resource efficiency | <ul style="list-style-type: none"> - Allocation of capital and revenue spending determined by cost-benefit analysis, whole-life costing and risk-based prioritisation; - Duties for cooperation, sharing information and coordinating activities are legal established (e.g. Civil Contingencies Act 2004 / Regulations 2005). | <ul style="list-style-type: none"> - The potential for Catchment-Based Approaches (CaBA) whereby flood alleviation schemes deliver multiple benefits (e.g. environmental, recreational etc.) is constrained by absence of methods for performing cross-sectoral cost-benefit analysis. Moreover, further research is needed to demonstrate that CaBA can significantly reduce the likelihood of flooding (POSTNOTE, 2014). |
| LEGITIMACY | Social equity | <ul style="list-style-type: none"> - Partnership Funding enables Grant-in-Aid to be allocated across a wider range of smaller projects, as opposed to a few high-value projects; thus in theory at-risk communities have an equal opportunity of implementing schemes; - Deprivation is factored into the funding calculator; | <ul style="list-style-type: none"> - Evidence to suggest that achieving Partnership Funding may be easier in some communities, particularly those with high social capital, than others; - Socially perceived inequalities emerged in the Winter 2015/16 floods and perceived north-south divide in defence spending; |
| | Accountability | <ul style="list-style-type: none"> - Post-event inquiries hold relevant actors accountable; - A range of legal proceedings can be initiated to challenge decision-making and hold public bodies to account. | <ul style="list-style-type: none"> - Lack of a systematic (proactive as opposed to reactive) approach for reviewing, assessing and challenging FRM practice and governance. |
| | Transparency | <ul style="list-style-type: none"> - All governmental bodies are subject to public scrutiny; - Local scrutiny boards are also established under the Flood and Water Management Act 2010 to evaluate local FRM strategies. | <ul style="list-style-type: none"> - Some defence schemes have received allocation of funding outside the national procedure for Partnership Funding, with little explanation; - A potential drawback of the ‘scrutinising culture’ is the tendency to unfairly attribute blame. |

| | Evaluation criteria | - Supportive features of flood risk governance | - Constraining features of flood risk governance |
|-------------------|----------------------------|---|---|
| LEGITIMACY | Participation | <ul style="list-style-type: none"> - Citizen engagement is highly embedded within English flood risk governance, with widespread examples of success (e.g. Defra Pathfinder projects; Defra, 2012b); - Statutory duties to consult the public (e.g. Flood Risk Regulations 2009, Flood and Water Management Act 2010). | <ul style="list-style-type: none"> - Sustaining and motivating community interest can prove challenging post-flood and risk perception dwindles; - Resource constraints limit the roles of community engagement officers within the Environment Agency and Local Authorities. |
| | Access to information | <ul style="list-style-type: none"> - Flood risk information is publically available (e.g. Community Risk Registers, national flood risk mapping). | <ul style="list-style-type: none"> - According to the National Audit Office (2014) local communities appear to lack information about how defence maintenance is being de-prioritised in some areas and implications for flood risk. |
| | Procedural justice | <ul style="list-style-type: none"> - With Partnership Funding, at-risk communities have an equal opportunity of implementing schemes, provided that local sources of funding are secured; - In spatial planning, development (including development on the floodplain) continues to be assessed within a nationally consistent decision-making framework. | <ul style="list-style-type: none"> - With regards to flood insurance, the cross-subsidisation of flood risks between areas of high and low risks raises questions about whether it is fair for those at lower risks to be effectively paying for those in high risk areas. This is made more explicit under the new Flood Re system – at least until the scheme transitions towards risk-reflective pricing. |
| | Acceptability | <ul style="list-style-type: none"> - Public consultation and participation methods are widely used to facilitate understanding and acceptance of FRM schemes. | <ul style="list-style-type: none"> - Societal expectation that the State should prevent floods from occurring and limited awareness of permissive responsibilities or understanding of risk management authorities. Political ‘knee jerk’ reactions (e.g. 2013/14 and 2015/16 winter floods) reinforce this view. |

5. Evaluating fluvial and coastal flood defence and mitigation governance in England

To demonstrate the application of the evaluation framework, this section examines fluvial and coastal flood defence and mitigation governance in England (for a more detailed account the reader is referred to Alexander et al., 2016).

5.1 Evaluating the contribution to societal resilience

England's capacity to resist flooding has been reinforced by a six year spending programme, which commits £2.3bn towards 1,400 defence and mitigation schemes to offer a 5% reduction in flood risk by 2021 (Defra, 2014a). Moreover, existing lines of defences have proven to be highly effective in recent years (Environment Agency, 2014). However, the Winter 2015/16 floods highlighted some weaknesses in the current system when faced with extreme flood events. Recognising that such events may become more frequent in the future, the UK Government has since launched a National Flood Resilience Review to examine how England might be better prepared for flooding (Defra et al., 2016).

A focal point of this review concerns the current and future investment strategy for flood defence and mitigation. This follows previous scrutiny of capital and revenue budgets for funding new projects and asset maintenance, respectively. In the aftermath of the Winter 2013/14 floods, the National Audit Office (2014) reported that the total funding for flood defence maintenance decreased by 10% in real terms between 2010-11 and 2014-15. The perceived shortfall in revenue for maintenance work and decision to allocate this on an annual basis was a recurring criticism voiced by flood risk professionals. Since the time of data collection this budget has now been protected until 2021 (HM Treasury, 2015). Whilst this is an important step-forward in securing revenue in the medium-term, a continuation or extension of this spending programme is needed to enhance capacities to resist flooding in the longer-term.

An important step-change in policy has been the implementation of Partnership Funding in 2012 (Defra, 2012a). Under this new scheme, Grant-in-Aid available through the Department for Environment, Food and Rural Affairs (Defra) must be supported by locally-sourced funding, via Local Authorities, the private sector and/or civil society. In terms of capacities to resist, this approach enables more flood defence schemes to be developed than the previous system which favoured high-priority schemes (Defra, 2014b).

“[It] creates a kind of hybrid system where there is still the backbone of national funding and national prioritisation...but a sense that local input and local funding can add to, increase the scale of the scheme and help to influence the time of projects, the nature of projects, so that you have both national and local priorities being delivered together. The consequences of that, is that about 25% more schemes are being delivered than if funding was left to national government ” (former National-level policymaker)

However, concerns have also been expressed about the difficulties of securing additional funds at the local scale. The River Thames Scheme (RTS) is a good example of this; “The challenge ... with our finances being more and more squeezed is how do we find that local contribution...*There is a danger that we might not be able to deliver the full programme of schemes*” (Local Authority, RTS). Thus in practice, the success of Partnership Funding is challenged by a range of factors. To date, Partnership Funding has largely been delivered through the redistribution and diversification of public sector sources, with ca. 25% of

financial contributions between April 2011 and March 2015 of private sector origin (NAO, 2014). The need to reduce dependency on state money was an expressed concern, e.g. “Something like 70% of matched funding that EA has received so far has come from other areas of government, but as public funding is cut, those options will diminish” (Environmental NGO). Moreover, the success of attracting private investors has been questioned, especially as only £40m of the £148m secured to date has come from sources beyond local government (Efra committee, 2015).

Nonetheless, Partnership Funding has successfully helped to diversify funding sources, reduce dependency of Grant-in-Aid and helped to ‘unlock’ schemes previously at a standstill. This is particularly evident in the Leeds case study and the River Aire Flood Alleviation Scheme (RAFAS), which, when aligned to the economic growth agenda, was able to secure funding through Growth Fund monies available from the Department for Business, Innovation and Skills and Defra. The delivery of multiple benefits is seen by many interviewed as an important means of diversifying funding sources for FRM. Although this could be enhanced further through more integrated catchment-based approaches, a key constraint to this is the lack of methods for performing cross-sectoral cost-benefit analysis. This is something that warrants further research.

Although the capacity to absorb and recover predominantly concerns other aspects of flood risk governance (Table 5), there are some aspects of defence/mitigation governance that are relevant. In particular, the use of demountable flood defences and property level measures play an important role in lessening the impact of flood events. Triggered by the Winter 2015/16 floods, the government also launched a Household Flood Resilience Grant Scheme to provide grants up to £5000 to help adapt affected properties (Priestley, 2016). Indeed, the use of different types of measures, employed at multiple scales, is a considerable strength of the English system. However, there were also expressed reservations about the political knee-jerk reactions that followed the Winter 2013/14 floods. Of relevance to the evaluation of resilience, several interviewees commented that the government’s reaction could instil the impression that the State will intervene and make funds available to either prevent flooding through large-scale defence schemes or assist with financial recovery. Perversely, this could discourage householders from taking steps to proactively manage their own risk. It is clear that consistent communication messages are required with regards to flood risk, management decisions and the distribution of responsibilities.

With respect to adaptive capacity, the application of managed adaptive approaches in large-scale schemes (e.g. RAFAS) instils a degree of flexibility to adjust responses to suit changing conditions. Climate-change concerns are also factored into Catchment Flood Management Plans, which support strategic decision-making over a 50 to 100 year timescale. In addition to forward-planning, there is also an established culture of institutional learning. An example of this, are the independent and public inquiries which have become common practice (e.g. Pitt, 2008).

5.2 Evaluating resource efficiency

The National Investment Plan was universally regarded by those interviewed as a necessary step in allocating resources for defence measures in the medium-term. This approach provides a degree of much needed certainty to enable Risk Management Authorities to ‘package’ projects and source competitive prices from suppliers (ASC, 2014). Moreover, it is anticipated that the efficiency savings made will be reinvested in defence and mitigation

projects (Defra, 2014b); thus providing a positive feedback into efforts to enhance the capacity to resist flooding.

However, a negative feedback loop also exists in relation to Cost-Benefit Analysis (CBA), from which the allocation of capital and revenue spending, the type of measure(s) and standard of protection, are determined. On one hand, CBA provides a means of allocating stretched financial resources on a priority-basis. On the other, it means that schemes cannot be approved for funding until a favourable cost-benefit ratio is obtained (i.e. £8 benefit achieved for every £1 of government-spend), which can prove difficult for certain areas to achieve. For example, in the Kingston-upon-Hull case study, professionals commented on the nature of potential funding partners; “in this area our partners are developers, agriculture, inward investors ... [but] the partnership funding rules do not favour development, agriculture and inward investment” (Local Authority). Furthermore, the Leeds case study provides an example where achieving the 8:1 ratio meant the need to downscale the standard of protection of the scheme and therefore highlights the trade-offs that are made between the pursuit of resilience and resource efficiency.

5.3 Evaluating legitimacy

A deprivation bias is embedded within the FRM funding calculator in an attempt to deliver a more socially equitable approach (Defra, 2012a). This bias recognises that deprived areas are “least likely to be able to contribute towards the cost of a flood defence scheme and less able to recover after a flood without additional support from the state” (former National-level policymaker). This reflects a shift in principles of social justice underlying the allocation and distribution of resources. Whereas the past was characterised by strong utilitarianism, with tax payers’ money directed towards schemes that maximised economic efficiency, this is now complemented by egalitarian principles (Thaler and Hartmann, 2016).

Although this is a positive feature of governance, perceptions of inequalities are equally important in determining the acceptability of FRM decision-making. In particular, the Winter 2013/14 floods seemed to instil the impression that *‘those who shout the loudest’* are able to assert their demands through political networks and the media. A representative from an Environmental NGO remarked “large floods do become political footballs...why did 150 homes in Somerset get all that money and attention and 4,000 in the north of England didn’t.” (Environmental NGO). In the case of the Somerset Levels this resulted in £10m funding from central Government for dredging and repair work, without a formal cost-benefit analysis and irrespective of expert advice (NAO, 2014). These observations reveal the importance of transparency and accessibility to information about funding allocations. In theory, Partnership Funding supports procedural justice as all schemes are eligible, providing additional sources of funding are secured; however, examples such as this appear to support the impression that this is easier in some communities than others.

In terms of access to information, all flood risk information is publically available (e.g. Community Risk Registers, national flood risk mapping etc.). There are also statutory duties to consult the public (e.g. Flood Risk Regulations 2009) and requirements in policy for Risk Management Authorities *‘to work in partnership with communities’* (Defra/EA, 2011). Public participation is highly embedded within governance, with widespread examples of good practice (e.g. Defra, 2012b). There is also evidence of a range of engagement methods being deployed. For example, public exhibitions were used to demonstrate the flood modelling underscoring the flood alleviation scheme in the Hull case study and facilitate dialogue at the public-professional interface.

Frequent reviews by Parliamentary Committees, the National Audit Office and independent inquiries (e.g. Pitt, 2008) also help to enhance transparency and accountability, as well as promoting opportunities for learning. Although caution should be exercised to ensure that this does not create a ‘scrutinising culture’ that unfairly attributes blame, something which was widely observed in discussions relating to the Winter 2013/14 floods.

5.4 Recommendations for strengthening governance

This evaluation highlights multiple pathways through which societal resilience, efficiency and legitimacy are delivered, as well as identifying useful entry points for strengthening governance. From these insights the following recommendations are made;

- There needs to be a continuation or extension of the current spending programme once the current Investment Plan is delivered in 2021, which gives equal consideration to capital and revenue funding from the outset. This will ensure that capacities to resist flooding are supported in the medium-term.
- Realising the potential of Partnership Funding and reducing dependency on public monies, requires a strategy to promote private sector contributions, based on further research to understand motivations and incentive mechanisms;
- There is a need to better manage societal expectations about FRM to enhance acceptance of risk-based, ‘living with water’ philosophy and empower individuals to adopt adaptive behaviours (e.g. implementation of property-level measures). This requires open and honest public engagement, investment in supportive mechanisms and consistent communication.

6. Conclusions

This paper presents a coherent framework for evaluating flood risk governance in the pursuit of societal resilience, efficiency and legitimacy. Through empirical research conducted in England, the applicability and value of this framework as a tool for identifying strengths and weaknesses of current governance arrangements, is demonstrated. This research not only addresses a neglected gap in the study of flood risk governance, but provides an evaluative approach that can be applied to different spatial and temporal scales of study. Moreover, where similar normative standards exist, this framework could serve as an important means of facilitating cross-country comparisons, from which transferable lessons could be identified.

Further research is needed to document the potential shifts in importance of selected criteria and resilience, efficiency and legitimacy goals. Such differences may manifest: i) across sub-arrangements of flood risk governance (e.g. spatial planning, flood insurance etc.); ii) where modes of governance vary (centralised, public-private etc.); iii) across time; and iv) between countries with differing socio-cultural norms and values. Such research could lead to more nuanced benchmarks for success. Beyond flood risk governance, further research to explore the potential applicability to other types of natural hazards is warranted. Nonetheless, the evaluation framework provides a robust and comprehensive tool that can be appropriately tailored to suit these future research needs, as well as providing a necessary first step in assessing, monitoring and strengthening flood risk governance.

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References

- Aarhus Convention 1998, Convention on access to information, public participation in decision-making and access to justice in environment matters, <http://www.unece.org/fileadmin/DAM/env/pp/documents/cep43e.pdf>, (accessed 2/09/2013)
- Adaptation Sub-Committee of the Committee on Climate Change (ASC) (2014) Managing climate risks to well-being and the economy – Adaptation Sub-Committee Progress Report 2014. Committee on Climate Change: London.
- Adger, N.W., Arnell, N.W. and Tompkins, E.L. (2005) Successful adaptation to climate change across scales. *Global Environmental Change*. 15. 77-86
- Ahrens, J. And Rudolph, P.M. (2006) The importance of governance in risk reduction and disaster management. *Journal of Contingencies and Crisis Management*. 14 (4). 207-220
- Alexander, M., Priest, S., Micou, A.P., Tapsell, S., Green, C., Parker, D., and Homewood, S. (2016) Analysing and evaluating flood risk governance in England – Enhancing societal resilience through comprehensive and aligned flood risk governance. STAR-FLOOD Consortium. Flood Hazard Research Centre, Middlesex University.
- Bell, S. and Hindmoor, A. (2009) *Rethinking governance: The centrality of the state in modern society*. Cambridge University Press: Melbourne, Australia
- Bowers, J. and Robinson, P.H. (2012) Perceptions of fairness and justice: The shared aims and occasional conflicts of legitimacy and moral credibility. *Wake Forest Law Review*. 47. 211-284
- Bulkeley, H. and Mol, A.P.J. (2003) Participation and environmental governance: Consensus, ambivalence and debate. *Environmental Values*. 12(2). 143-154
- Chaffin, B.C, Gosnell, H. and Cosens, B.A. (2014) A decade of adaptive governance scholarship: Synthesis and future directions. *Ecology and Society*. 19 (3). 56
- De Bruijn, K.M. (2004) Resilience indicators for flood risk management systems of lowland rivers. *International Journal of River Basin Management*. 2 (3). 199-210
- Department for Environment, Food and Rural Affairs (Defra) et al. (2016) National Flood Resilience Review: Government action to tackle floods. Press Release, 26th January 2016.
- Department for Environment, Food and Rural Affairs (Defra) (2014a) Reducing the risks of flooding and coastal erosion: An investment plan. December 2014.
- Department for Environment, Food and Rural Affairs (Defra) (2014b) Flood and coastal erosion resilience partnership funding evaluation. Final report. April 2014.
- Department for Environment, Food and Rural Affairs (Defra) (2012a) Principles for implementing flood and coastal resilience funding partnerships. Defra; London.
- Department for Environment, Food and Rural Affairs (Defra) (2012b) Flood resilience community pathfinder prospectus. Defra; London.

Defra/EA (2011) The national flood and coastal erosion risk management strategy for England. The Stationary Office; London

Djalante, R., Holley, C. And Thomalla, F. (2011) Adaptive governance and managing resilience to natural hazards. *Int. J. Disaster Risk Sci.* 2(4). 1-14

Driessen, P., Dieperink, C., van Laerhoven, F., Runhaar, H.A.C. and Vermeulen, W.J.V. (2012) Towards a conceptual framework for the study of shifts in modes of environmental governance – Experiences from The Netherlands. *Environmental Policy and Governance.* 22. 143-160

Duit, A., Galaz, V., Eckerberg, K. and Ebbesson, J. (2010) Governance, complexity and resilience. *Global Environmental Change.* 20. 363-368

Environment Agency (2014) Written evidence, Winter floods inquiry. March 2014. Submitted to the Environment, Food and Rural Affairs Committee (Efra committee). Available from <http://www.publications.parliament.uk/pa/cm201415/cmselect/cmenvfru/240/240.pdf>

Environment Agency (2012) Flood plan guidance for communities and groups. Environment Agency; Bristol.

European Commission (2001) European governance: A white paper. Brussels, 25.7.2001. COM(2001) 428.

Fereday, J., and Muir-Cochrane, E. (2008) Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative methods.* 5 (1).80-92.

Feyen, L., Dankers, R., Bódis, K., Salamon, P. and Barredo, J.I. (2012) Fluvial flood risk in Europe in present and future climates. *Climatic Change* 112(1).47-62.

Folke, C. (2006) Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change.* 16 (3). 253-267

Gross-Camp, N.D., Martin, A., McGuire, S., Kebede, B. and Munyarukaza, J. (2012) Payments for ecosystem services in an African protected area: exploring issues of legitimacy, fairness, equity and effectiveness. *Fauna and Flora International, Oryx.* 46(1). 24-33

Hanley, N. and Black, A.R. (2006) Cost benefit analysis and the Water Framework Directive in Scotland. *Integrated Environmental Assessment and Management.* 2 (2). 156-165

Hartmann, T. and Spit, T. (2016) Legitimizing differentiated flood protection levels – consequences of the European flood risk management plan. *Environmental Science and Policy.* 55. 361-367

Hegger, D., Driessen, P., Dieperink, C., Wiering, M., Raadgever, T. and van Rijswijk, M. (2014) Assessing stability and dynamics in flood risk governance. *Water Resources Management.* DOI 10.1007/s11269-014-0732-x

Hendriks, F. (2014) Understanding good urban governance: essentials, shifts and values. *Urban Affairs Review.* 50 (4). 553-576

HM Treasury (2015) Spending review and Autumn Statement 2015. November 2015. The Stationery Office: London

Johnson, C., Penning-Rowsell, E. and Parker, D. (2007) Natural and imposed injustices: the challenges in implementing 'fair' flood risk management policy in England. *The Geographical Journal.* 173. 4. 374-390

Lange, P., Driessen, P.P.J., Sauer, A., Bornemann, B. and Burger, P. (2013) Governing towards sustainability – Conceptualising modes of governance. *Journal of Environmental Policy and Planning.* DOI:10.1080/1523908x.2013.769414

- Lindgren, K-O. And Persson, T. (2010) Input and output legitimacy: Synergy or trade-off? Empirical evidence from an EU survey. *Journal of European Public Policy*. 17 (4). 449-467
- Lockwood, M., Davidson, J., Curtis, A., Stratford, E. and Griffith, R. (2010) Governance principles for natural resource management. *Society and Natural Resources*. 23 (10). 986-1001
- McKinnon, D. and Driscoll Derickson, K. (2012) From resilience to resourcefulness - A critique of resilience policy and activism. *Progress in Human Geography*. 37 (2). 253-270
- National Audit Office (NAO) (2014) Strategic flood risk management. HC 780, Session 2014-15, 5th November 2014.
- Newig, J. and Fritsch, O. (2008) Environmental governance: Participatory, multi-level and effective? UFZ Discussion Papers. 15/2008 GoverNat 8, November 2008.
- OECD (2015) OECD principles of water governance. Directorate for Public Governance and Territorial Development
- Ostrom, V., Tiebout, C. and Warren, R. (1961) The organisation of government in metropolitan areas: a theoretical inquiry. *The American Political Science Review*. 831-842
- Pahl-Wostl, C., Becker, G., Knieper, C. and Sendzimir, J. (2013) How multilevel societal learning processes facilitate transformative change: a comparative case study analysis on flood management. *Ecology and Society* 18(4). 58
- Penning-Rowsell, E.C. and Johnson, C. (2015) The ebb and flow of power: British flood risk management and the politics of scale. *Geoforum*. 62. 131-142
- Pierre, J. and Peters, B.G. (2000) *Governance, politics and the State*. Macmillan Press; Basingstoke, UK
- Pitt M (2008) *Learning lessons from the 2007 floods*. The Pitt Review. Cabinet Office; London
- POSTNOTE (2014) *Catchment-wide flood management*. The Parliamentary Office of Science and Technology; London.
- Priest, S., Alexander, M., Green, C., Buijze, A. and Van Doorn-Hoekveld, W. (2013) Theoretical background to the evaluation framework. [In] Laurrue, C., Hegger, D., Trémorin, J-B (Eds). *Researching flood risk governance in Europe: Background theories*. STAR-FLOOD deliverable report (Report No. D2.2.2)
- Priestley, S. (2016) *Winter floods 2015-16*. Briefing Paper. Number CBP7427, 21 January 2016. House of Commons Library: London
- Renn, O., Klinke, A. and van Asselt, M. (2011) Coping with complexity, uncertainty and ambiguity in risk governance: A synthesis. *AMBIO*. 40. 231-246
- Rijke, J., Brown, R., Zevenbergen, C., Ashley, R., Farrelly, M., Morison, P. and van Herk, S. (2012) Fit-for-purpose governance: A framework to make adaptive governance operational. *Environmental Science and Policy*. 22. 73-84
- Rogers, P. and Hall, A.W. (2002) *Effective Water Governance*. TEC Background Paper No 7, Global Water Partnership
- Scharpf, F.W. (1999) *Governing in Europe*. Oxford: Oxford University Press
- Schmidt, V.A. (2013) Democracy and legitimacy in the European Union revisited: Input, output and 'throughput'. *Political Studies*. 61. 2-22
- Shiroyama, H., Yarime, M., Matsuo, M., Schroeder, H., Scholz, R. and Ulrich, A.E. (2012) Governance for sustainability: knowledge integration and multi-actor dimensions in risk management. *Sustainability Science*. 7 (supplement 1). 45-55

Swyngedouw, E. (2005) Governance innovation and the citizen: The Janus face of governance-beyond-the-state. *Urban Studies*. 42(11).

Termeer, C., Dewulf, A., van Rijswick, H., van Buuren, A., Huitema, D., Meijerink, S., Rayner, T. And Wiering, M. (2011) The regional governance of climate adaptation: A framework for developing legitimate, effective and resilient governance arrangements. *Climate Law*. 2. 159-179

Termeer, C.J.A.M., Dewulf, A. and van Lieshout, M. (2010) Disentangling scale approaches in governance research: Comparing monocentric, multilevel and adaptive governance. *Ecology and Society*. 15(4). 29

Thaler, T. and Hartmann, T. (2016) Justice and flood risk management: reflecting on different approaches to distribute and allocate flood risk management in Europe. *Natural Hazards*. DOI 10.1007/s11069-016-2305-1

United Nations Development Programme (UNDP) (1997) *Governance for Sustainable Human Development*. UNDP: New York

Walker, G., Tweed, F. and Whittle, R. (2014) A framework for profiling the characteristics of risk governance in natural hazards contexts. *Nat. Hazards Earth Syst. Sci.* 14. 155-164

Young, O.R (1994) *International governance*. Cornell University Press: Ithaca